

**Restoring Reliability:  
Assessment Report of  
August 2003 Blackout in New York**

**Causes and Recommendations**

**United States Senator Charles E. Schumer  
August 10, 2004**

# **Restoring Reliability**

## **Executive Summary**

This report outlines the need for a new independent federal office to oversee and enforce reliability standards for the electricity industry. The new office would have the authority that both the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Council (NERC) lack and would serve to monitor and coordinate grid data to prevent future blackouts of the August 14<sup>th</sup> magnitude.

Since the deregulation of the electricity industry began in earnest in 1992, transmissions across the grid have changed drastically. However maintenance standards, communication and infrastructure investment have not kept pace at the expense of reliability and quality of service.

Under the current system, there is no federal agency that can enforce reliability standards for the industry. Nor is there an agency that is qualified and equipped to take on such a responsibility. FERC lacks the expertise and NERC is too closely tied to the industry to lead this effort. Moreover, both lack the authority to mandate any rules nor can either require the submission of all pertinent grid data for system-wide monitoring.

The office proposed by this report would fill this regulatory gap and would have both the authority and the expertise to ensure the viability and reliability of the transmission grid. The new office would be charged specifically with the following:

- Developing and enforcing all reliability standards.
- Coordinate and require open communication between all transmission and system operators as well as other participants in grid maintenance.
- Disseminating grid information throughout regional and national grid segments.
- Upgrade notification procedures and requirements between operators when problems exist
- Assist the industry with training of control room personnel and implementation of automated monitoring and other technology upgrades.
- Develop strategic plans for grid maintenance and investment.
- Conduct frequent audits of grid operators and assign performance-based ratings for the benefit of customers.

## **Restoring Reliability**

When fifty million people lost their power on August 14, 2003, both industry and government highlighted the need for stronger reliability standards for the electric grid. Until now, much of the debate over the best fix for reliability has focused on making industry standards that are now voluntary mandatory and enforceable. However, the industry is still adapting to competition and greater challenges exist, including ensuring communication among grid participants, establishing a suitable agency for reliability regulation, and requiring adequate transmission grid maintenance.

This report outlines the issues facing the industry and establishes the electricity transmission grid as a public good akin to the interstate highway system. It calls for the creation of a new independent federal office with the authority to enforce reliability standards on the industry to ensure and require proper coordination among the utilities and sufficient maintenance of the transmission grid.

### **The August 14 Blackout: What Went Wrong?**

The final report of the US Canada Joint Task Force found that a combination of system, industry and human error were among the main causes of the blackout. Computer systems at the utilities crashed; grid infrastructure was poorly maintained; grid monitors and the utilities failed to understand the weaknesses of the transmission system; levels of reactive power, which is used to stabilize the flow of electricity through transmission lines, were mismanaged; and there was a lack of real-time diagnostic support.

The report also determined that the companies involved in the outage had violated reliability standards, and that in some instances the voluntary reliability guidelines set by the North American Electric Reliability Council (NERC) were too ambiguous to be effective in preventing blackouts.

At the time of the blackout, First Energy (FE), an Ohio based utility, and the Midwest Independent System Operator (MISO), which is responsible for managing the electrical grid in Ohio and several other states, both experienced computer failures. As a result, FE and MISO were unable to detect power overloads on their portions of the grid. Overloaded power lines began to sag and were knocked out of service when they made contact with untrimmed trees. With no place to go, the power that would have been conducted on these lines was thrust back onto the grid, overloading other lines and thus beginning the cascade of outages spanning more than 9,000 square miles.

### **Deregulation: the New Function of the Transmission Grid**

The US transmission grid forms a highway for electricity to travel between power plants and electricity consumers. A reliable transmission grid that can be monitored comprehensively is essential to the health of the nation's economy and to a high quality of service for the American public.

Originally, the grid was developed to serve local utilities and their customers for a fixed rate of return. That is why, on a map, utility transmission systems often appear to spread across a limited, franchised radius centered in the middle of a densely populated area and in proximity to generating plants. However, following the Energy Policy Act of 1992, which began the process of deregulating the utilities, many of these geographic monopolies have been replaced with individual generators, transmission companies, and utilities in a competitive environment. The Federal Energy Regulatory Commission (FERC) began implementation of the Act in 1996 with the stated objective to “remove impediments to competition in wholesale trade and to bring more efficient, lower cost power to the Nation’s electricity customers.” FERC orders required open and equal access to jurisdictional utilities’ transmission lines for all electricity producers, thus facilitating the States’ restructuring of the electric power industry to allow customers direct access to retail power generation.

As a result of various federal and state initiatives throughout the country, the electric power industry is transitioning from a system of regulated, local monopolies which provided their customers with a total package of all electric services and to one in which competitive generating companies provide the electricity and separate utilities provide transmission and distribution services. In addition, prior to the blackout, states have been moving away from regulations that set rates for electricity. As a result, many generators located at much longer distances from customers are attempting to sell as much power as possible throughout a region. In other words, it is now a system in which multiple generators are using the grid to serve customers near and far, with the flow of power through the electrical grid becoming increasingly more complex and difficult to manage. Hundreds of individual companies are attempting to use the same resources and infrastructure that had previously existed for a few local players.

This means that at the same time the industry was adapting to the effects of competition and the profit driven marketplace, the grid was becoming a far more complicated highway. As such, tracking transmissions as well as identifying problems has become increasingly difficult and now requires a greater level of coordination throughout the industry.

### **Failings of the Energy Industry: Strains on the Grid and a Lack of Governance**

The computer and grid monitoring failures that occurred at both the energy company and the ISO on August 14 could be considered to be an isolated occurrence. However, computer failures cannot be held accountable for the entire blackout. The computer failures set off a chain of events that in turn exposed a number of larger failures of the energy industry and its governance as a whole in the areas of communication between market participants and regulators, in the ability to adequately oversee the power transmissions themselves, and in the current structure of governance of the bulk power system.

### **Transmission Problems**

The overloaded lines and their proximity to untrimmed trees in this instance underscore major problems facing the energy industry. First, over the last decade, the number of transactions and the demand for energy carried across the country has increased substantially. Lines are often

carrying energy at close to their maximum capacity and operators are dealing with millions of inputs from the grid at a time. Under these conditions, overloads are common. Second, since the deregulation of energy companies began, utilities are now focused on cutting costs and maximizing profits, and have cut back on maintenance and capital investment for transmission lines. Reluctance to invest in new transmission infrastructure and the difficulty of siting new power lines has also slowed the construction of additional capacity.

### Overloading Transmission Lines

Prior to deregulation, the utilities typically distributed energy to consumers in a limited radius surrounding the generation plant for a fixed rate of return. The shift from this system to one in which energy must now travel over great distances from the plant to the consumer has increased pressure on the grid dramatically. At the same time, the sheer volume of transactions has impaired management and operation of the grid. Energy is transmitted from several directions and transmissions are not as easily deciphered as they were under the more localized system under regulation.

As traffic on the grid has grown, operating and monitoring equipment and practices have not kept pace. The need to address this growing gap between actual operation and effective management of the grid has even been recognized by industry organizations in the wake of the August 14<sup>th</sup> blackout. EPRI, the Electric Power Research Institute, has discussed a \$200 billion plan for upgrading the entire grid through the creation of an "energy internet" that would use computer technology to enhance the ability of grid managers to effectively monitor the activity levels and status of transmission systems. Although there has been a slow shift to digitized monitoring, many grid operators have not invested in expensive system upgrades that could improve reliability significantly.

### Inadequate Maintenance

Most power outages are caused when the lines themselves are disrupted. For example, a tree branch falls during a storm or, as in the August 14<sup>th</sup> blackout, power lines sag under pressure and hit a tree branch below. Simple maintenance including tree trimming can significantly improve reliability. However, the era of competition has lead utilities to cut maintenance costs to maximize profits rather than improve reliability.

According to GF Energy, over the last decade spending on maintenance has decreased by 30% for the electric industry. Unfortunately, the cost of maintenance is often greater than responding to a power outage. For instance, repairing a typical tree-caused outage costs about \$1,000 to repair. However, trimming trees in the area may cost close to \$10,000. In September, Hurricane Isabel left millions of homes without power in the Baltimore and Washington DC metro areas. The Washington Post reported that when regulators advised BGE, one of the area's largest utilities, to speed up its tree trimming, "the company balked, saying such a move would 'fail most cost-benefit analyses.'"

### Communication

In this day and age of an integrated transmission grid that spans across large regions, monitoring individual segments of the grid can do little to prevent major power outages unless data is shared regularly with neighboring and regional grid operators. Although the computer failures at FE and MISO prevented early identification of grid shortages, MISO and neighboring RTOs should have been sharing information about grid abnormalities and computer failures constantly for protection against the worst-case scenario. However, there was no clear communication policy between the RTOs, exacerbating the situation.

In addition, competition has led companies to treat technical information as their own property. Critical information directly related to system reliability, including power flow data, is often considered sensitive, and therefore private, further contributing to a lack of communication about reliability issues. Grid data that was once shared for the sake of reliability is now restricted by utilities, making it even more difficult to accurately assess the status of the electrical grid.

The practice of competitive companies sharing information with each other or with industry regulators and managers for mutual benefit is not uncommon. For example, the airlines share data regularly about faulty parts and monitoring irregularities with their competitors. This improves the overall service of the industry, which in turn benefits the airlines. Unfortunately, the energy industry has yet to learn this lesson and there remains no centralized national database to facilitate such a high level of communication.

### Infrastructure Investment

As transmission demands increased, investment into the transmission infrastructure has not kept pace. Expanding and enhancing transmission infrastructure is very expensive, and under the system of competition, it is not always economically advantageous for energy companies to invest in infrastructure upgrades. According to GF Energy, utilities have dropped their transmission spending by about 35% in the past 10 years.

They estimate that over \$15 billion should have been spent since 1990 to replace aging transmission infrastructure—a deficit of over \$1 billion a year. These trends only serve to complicate the problems with maintenance and traffic on the grid. Conversely, demand has skyrocketed. XENERGY estimates that as of August 2002, 36,000 megawatts (MW) of electricity demand is being competitively supplied in the United States, a remarkable increase from an estimated 15,000 MW that was supplied in 2001. A megawatt is roughly equivalent to the amount of electricity used to power 1,000 homes. Overall, electricity demand has been growing at 2-3% per year, but additions to the transmission system have been growing by 0.7% per year.

### **Governance**

The US Canada Joint Task Force found in its report that both FE and MISO had violated reporting rules, however these rules are not mandatory and the ability to bring about any punitive action in an effort to prevent future violations is severely limited. To date, the

transmission sector of the electrical industry has operated under a set of voluntary guidelines, with no concrete federal penalties for those who break the rules and jeopardize reliable energy service.

### Regulating Entities

The Federal Energy Regulation Commission (FERC) is the economic regulator of the energy industry. FERC does not have the authority to develop and enforce reliability standards for the transmission grid, nor does it engage in real-time reliability monitoring activities for the grid. The jurisdiction of FERC is largely limited to interstate transmission of electricity, the construction of transmission lines across state borders, and wholesale energy rates.

States have traditionally had the authority to set enforceable reliability standards, but that authority is limited to intrastate retail transmission, and is not adequate to guarantee reliability across large, regional transmission systems that cross multiple state lines.

Following the 1965 blackout, the North American Electric Reliability Council (NERC) was made effective in 1968 and has assumed responsibility for setting reliability standards and monitoring the grid. NERC is an international organization, covering the United States, Canada and Mexico. NERC's membership includes ten Regional Reliability Councils, whose members come from the electric industry, including investor-owned utilities, federal power agencies, rural electric cooperatives, state, municipal and provincial utilities, independent power producers, power marketers, and end-use customers.

A ten-member Board of Trustees governs NERC with guidance and input from an industry Stakeholders Committee that elects the trustees, votes on amendments to bylaws, participates in the budget process and provides advice and recommendations to the Board on policy matters. Board meetings are attended by observers from the Department of Energy, FERC, similar agencies from Mexico and Canada, and a variety of industry organizations. The Department of Energy and its international counterparts have a vote on standards, although they are severely outnumbered. Again, NERC is unable to enforce its standards and they non-governmental guidelines without a statutory mandate.

FERC is attempting to establish new regional governance organizations, such as MISO, that will operate the transmission portion of the electrical system. These operational entities are called Regional Transmission Organizations (RTO) and are being structured under the guidance found in FERC Order 2000. Both FERC and NERC encourage companies that own, operate, or control part of the transmission grid to form RTOs. Although FERC attempted to build in guidelines and safeguards to ensure

independent operation of the transmission grid, including requirements conduct independent audits to ensure that owners do not exert undue influence over RTO operation, concern remains that some RTOs may be too closely tied to the market participants that they are supposed to watch over.

### **Rethinking Transmission: the Grid as a Public Service**

The function of the transmission grid is comparable to the interstate highway system. Both are the tracks on which billions of dollars of goods and services are transported every day. Under the interstate system, sections of highway are operated and maintained by the state they occupy, just as transmission companies operate and maintain their own sections of the grid.

Under the interstate highway system, however, transportation and engineering experts at the USDOT oversee infrastructure investment and ensure that the highways are safe and well maintained. This management and oversight is not afforded to the infrastructure that carries electricity. The transmission grid provides a public service and as such, the government has a responsibility to ensure it can safely and reliably carry the electricity that keeps this nation running.

### **Solution: Restoring Reliability and Adding Accountability**

It is widely acknowledged that for significant improvements to be made to the reliability of the electrical system, reliability rules must be made mandatory and must be enforced by an entity capable of imposing penalties for noncompliance. Most proposals would grant FERC the authority to delegate the authority to a non-governmental organization and then exercise oversight over the development and enforcement of these rules.

### **A New Federal Office to Oversee Transmission**

Ensuring the reliability of the grid is a highly technical task. However, FERC, which was established to monitor the economic activities of the energy industry, lacks both the mandate and expertise to properly oversee the transmission grid. NERC, an international organization with the expertise, is run by the industry and relies on private stakeholders to approve standards. In fact, the final report of the US Canada Joint Task Force found that NERC “has no structural independence from the industry it represents”. The report also identified the need for more effective metrics to gauge NERC’s performance and for greater transparency regarding the functions of its senior management team. As such, granting the authority to one of these two institutions to set and enforce rules for the grid will not be a sufficient fix for transmission reliability. At the same time, there is no assurance that following the final report’s recommendation to make NERC funding more independent from the industry will adequately address the



organization's need to fully and independently make reliability policy decisions based solely on the public's best interest.

The US Canada Joint Task Force's final report includes 46 separate recommendations designed to enhance the reliability of the electrical grid. In many instances these recommendations fail to adequately assess the impact that market restructuring has had on reliability and rely on reforms of private organizations, like NERC, to ensure reliability. While these recommendations, such as reforming NERC's organizational structure and strengthening its compliance programs, represent small steps forward they fail to fully embrace the fact that the electrical grid must be treated as a public good. It is also far from certain that the final report's more progressive recommendations, including requirements for more rigorous reliability operator training and communication between operators and reliability coordinators, will be able to be effectively implemented under a voluntary, private regulatory organization.

Therefore, a separate federal government office should be established for the sole purpose of ensuring the viability and reliability of the transmission grid. This office would be responsible for establishing and enforcing all reliability standards and serve to coordinate open communication between all transmission and system operators as well as other participants in grid maintenance.

#### Mandatory Reporting and Information Sharing

It would be mandatory for grid operators to report grid data in real time to the new federal office. The office would then be able to ensure that this information is effectively disseminated to operators in a regional area, and used to enhance notification procedures between operators when problems exist.

#### Operator Training

The new office would also require and facilitate better training of control room personnel, improved automated monitoring of the grid and computer technology standard upgrades. The office would also be empowered to conduct frequent audits of grid operators and to assign them a public rating based on their performance akin to the Nuclear Regulatory Commission's color-coded rating system for the safety and operation of nuclear power plants. The office would also actively help reliability coordinators to evaluate and adopt improved real-time monitoring tools and develop improved direct methods of communication among coordinators.

#### Maintenance and Investment

It is not enough to the authority to develop rules for the grid. The office should develop and regularly update a strategic plan to improve the transmission grid infrastructure including target levels for new investment, expansion opportunities, and maintenance. The purpose of these targets would be to highlight areas where infrastructure investment would enhance reliability, and to propose reliability solutions in these areas. This

strategic plan could serve as a guideline for grid owners and operators based on industry wide information and expertise. Similar audits could be conducted and ratings assessed so that the public is aware of their operators' practices.

The new federal office's evaluation of infrastructure would also include IT infrastructure to ensure that reliability monitoring computer systems are functional, competently operated, and supported by adequate backup capability.